
Review of Radiological Monitoring at LBNL: Preliminary Technical Report

Environmental Sampling Project Task Force
Meeting, Berkeley, August 10, 2000

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Identified Areas of Concern

- A Concerns about current operations (1998 - 2000)**
- B Concerns about legacy contamination from past operations**
- C Concerns about historical exposures**
- D Risk-related concerns**

A.1 Is the tritium inventory at NTLF adequately determined?

Approach: Review inventory data, its accuracy, and relevance to determine the environmental impacts of NTLF

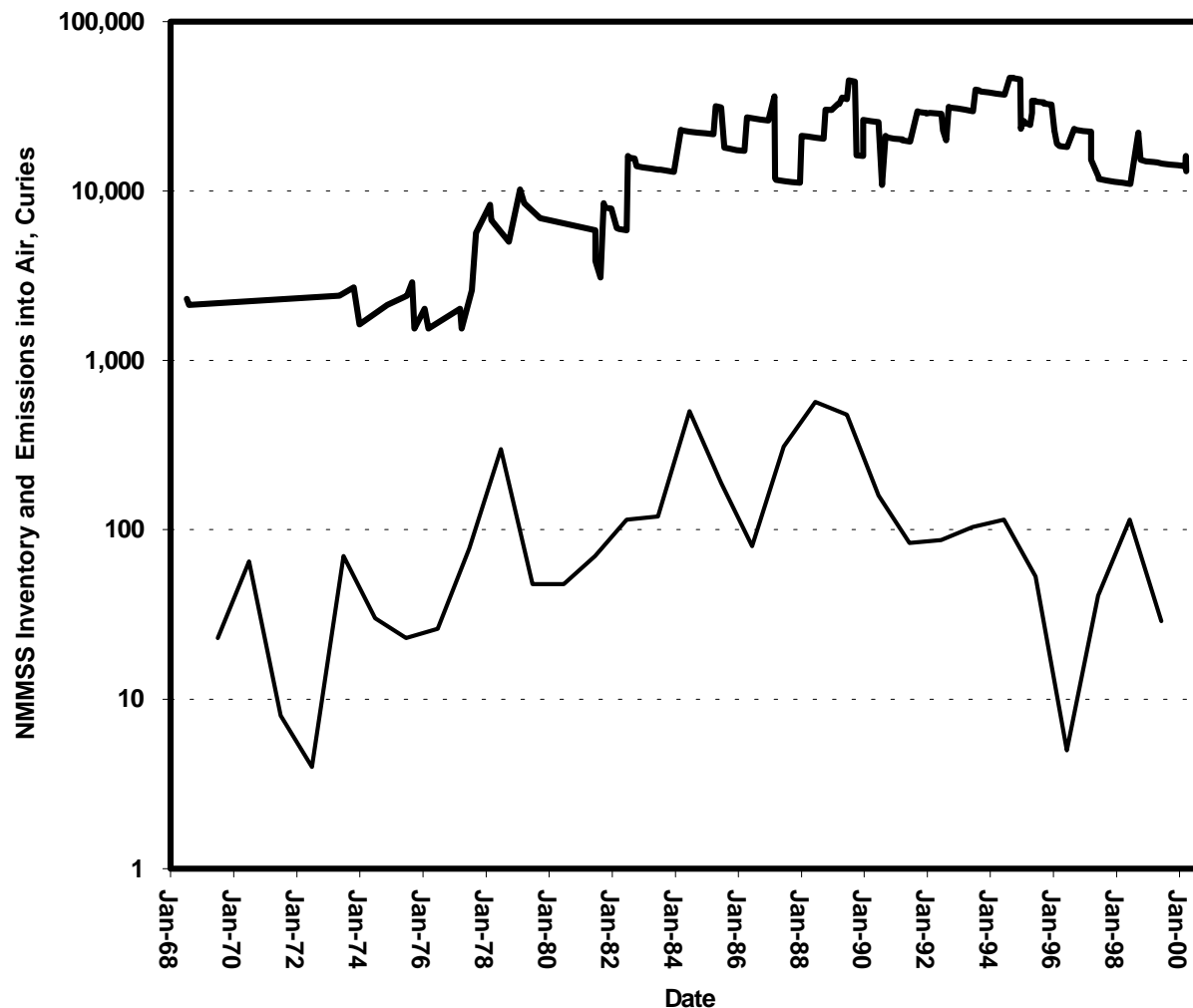
Findings to date:

The estimate of the tritium inventory at NTLF (13.000 Ci) associated with an error in the order of +/- 20%.

The inventory data does not allow to verify the releases into the environment.

It is desirable to improve the accuracy of tritium inventory.

Reported tritium inventory at NTLF (top) in relation to reported airborne releases of tritium into the air (bottom)



A.2 Are the releases of airborne tritium adequately monitored?

Approach: Review data on stack releases; evaluate internal consistency and uncertainties

Findings to date:

The silica gel data for HTO appears to be reliable.

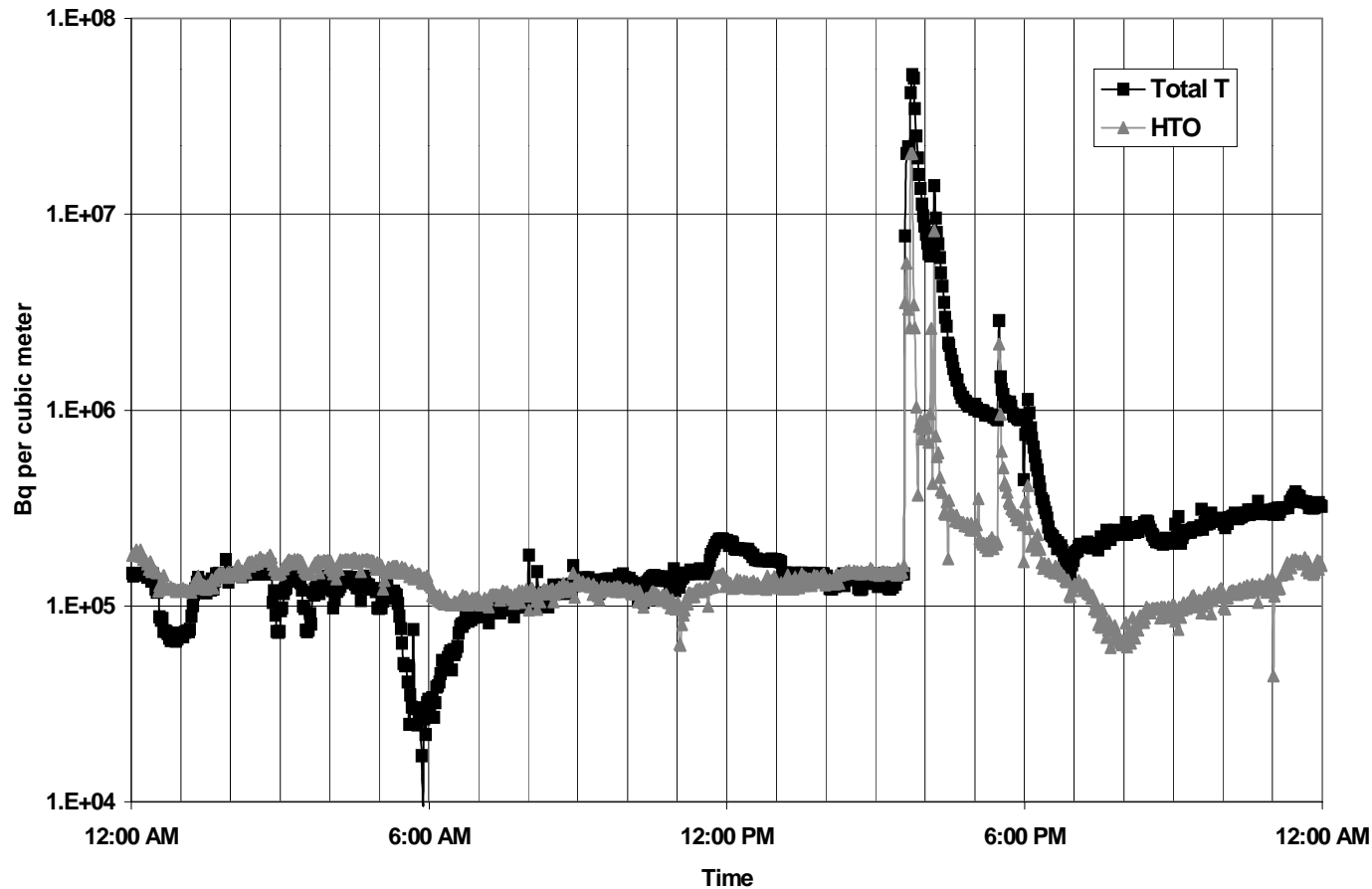
NTLF stack data for 1998 for non-HTO releases are uncertain.

The Real-time data (Overhoff system) is not suitable to verify the source term measured with silica gel system.

Tritium is often released from NTLF in short events, e.g. 0.2 Ci of HTO in 1000 seconds on March 25, 1998.

Atmospheric dispersion modeling of NTLF releases should take the short-term nature of the releases into account.

Real-time concentrations of HTO and total tritium in NTLF stack releases on March 25, 1998



Note: instrument background not subtracted

A.3 Is tritium in air measured at the right locations?

Approach: Compare potentially affected locations with locations actually sampled

Findings to date:

Discontinuous nature of releases does not allow to restrict sampling to major wind directions.

The network of ambient air monitoring for tritium should be expanded.

The number of monitoring sites at LBNL is well below the DOE average. At other DOE facilities with similar amounts of tritium emissions at least 16 wind directions (of 22.5 degrees) are monitored, which is recommended for LBNL as well.

Ambient air monitoring for tritium at DOE facilities

| Facility | 1998 Tritium Release (Ci) ^{a)} | Number of ambient air stations ^{b)} | 1998 calculated dose to facility MEI from all radionuclides and sources combined |
|--|---|--|--|
| E.O. Lawrence Berkeley National Laboratory | 115 | 6 (+3) ^{c)} | 0.28 mrem |
| Los Alamos National Laboratory | 818 | 52 | 1.1 mrem |
| Brookhaven National Laboratory | 39.5 | 22 | 0.21 mrem |
| Savannah River Site | 82,700 | 17 | 0.08 mrem |
| Pantex | 0.054 | 27 | 0.005 mrem |
| Lawrence Livermore National Laboratory | 110 | 20 | 0.055 mrem |

A.4 Is the sampling and analysis of tritium in air at a given location sufficiently accurate?

Approach: review observed versus expected water collected in silica gel samples, review results of split sampling program, review of contract laboratory performance

Findings to date:

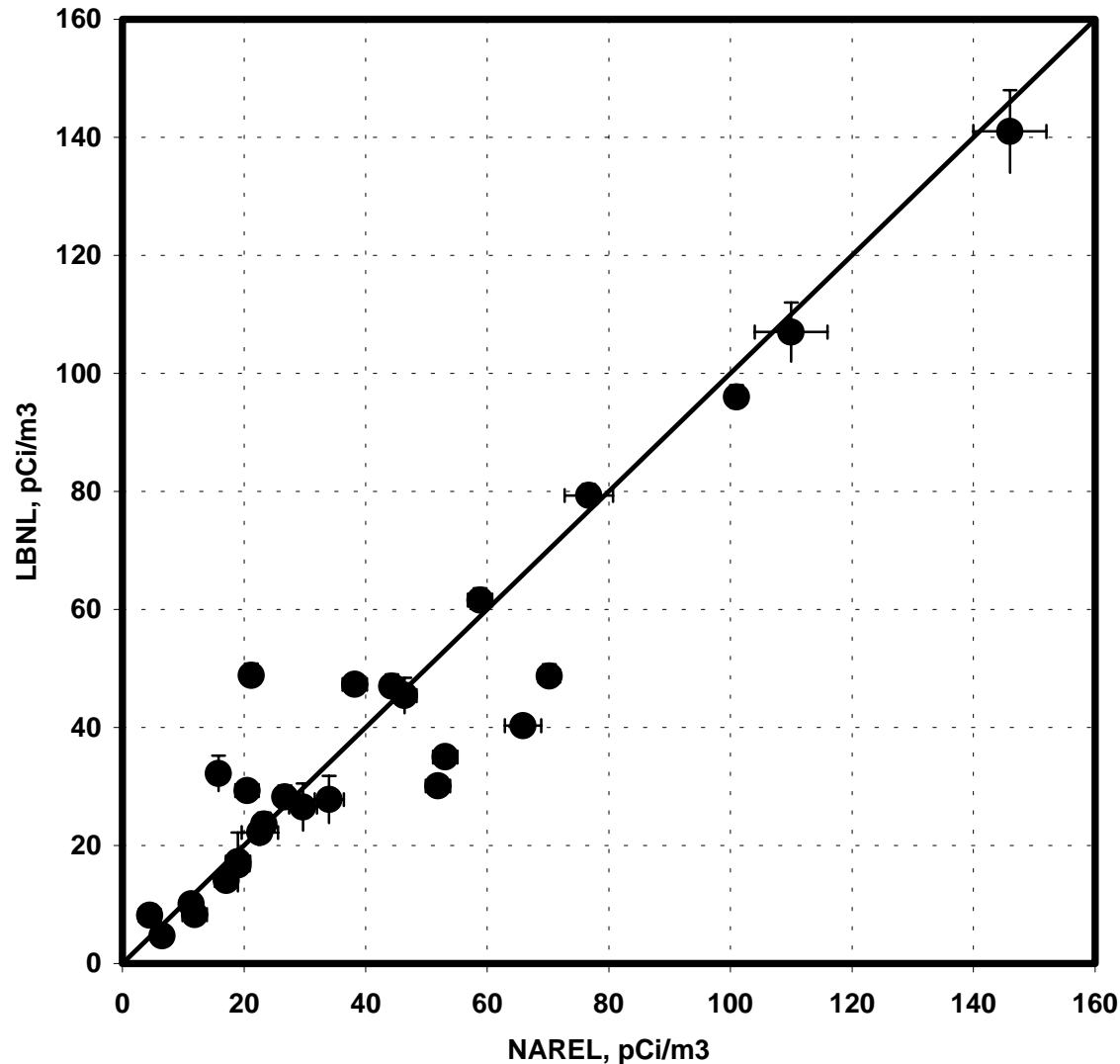
The analytical data for HTO in ambient air samples is verifiable, (uncertainty for samples LHS of less than 20%).

No evidence at this time to suggest that offsite exposures resulted in radiation doses exceeding 10 mrem/yr.

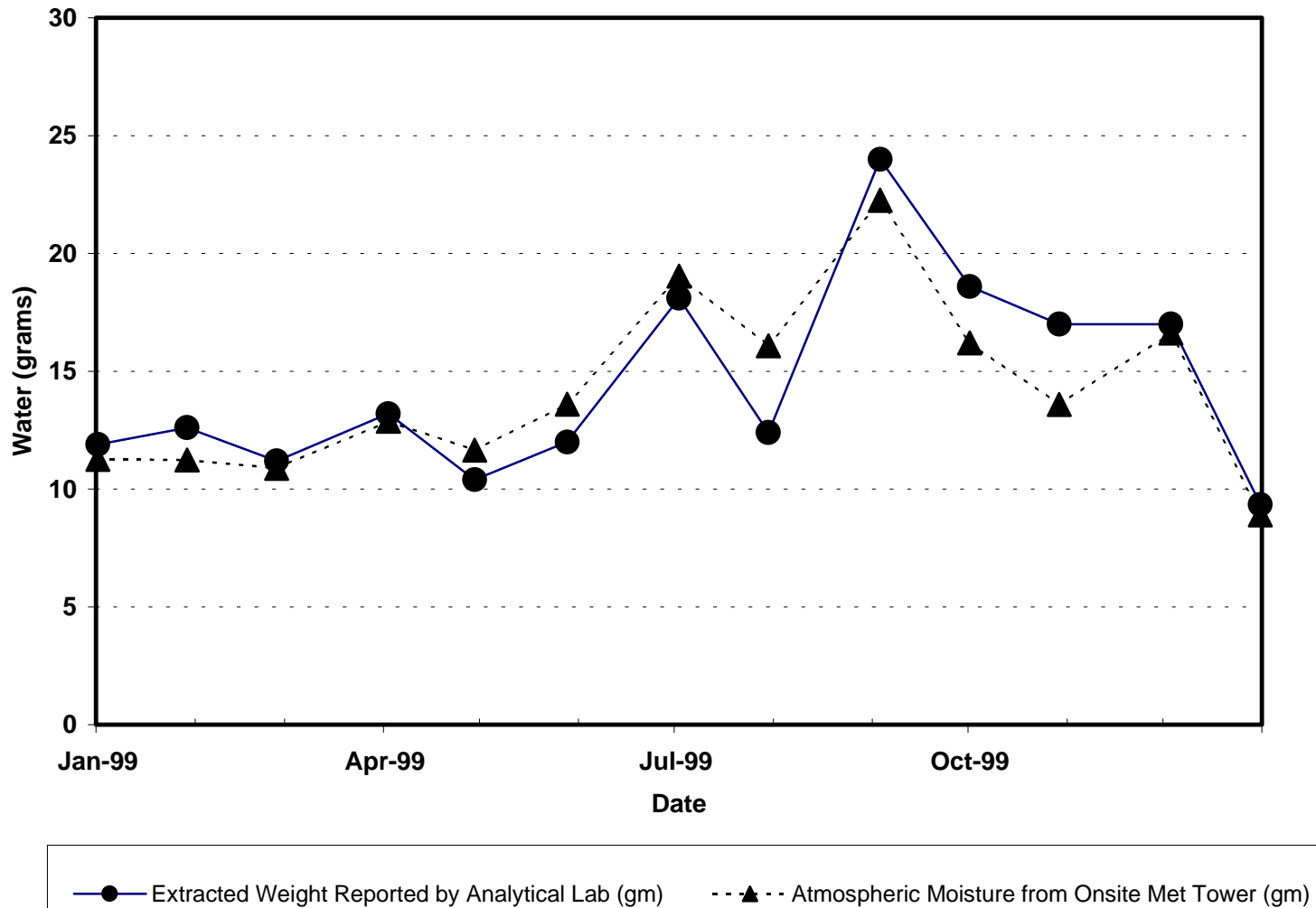
Information regarding the uncertainty of analytical data should be incorporated in the site environmental reports.

The amount of water collected in silica gel should be determined from the sampler weight difference rather than from the amount distilled in the laboratory.

Comparison of tritium split samples of EPA's NAREL and LBNL analytical laboratories for station ENV-LHS



Comparison of observed and expected water collected at ENV-69



B.1 Is LBNL's Draft Tritium Sampling and Analysis Plan sufficient to determine the extent and nature of legacy contamination at NTLF?

Approach: review of sampling plan regarding sampling media, sampling locations, analytical techniques, and QA/QC issues

Findings to date:

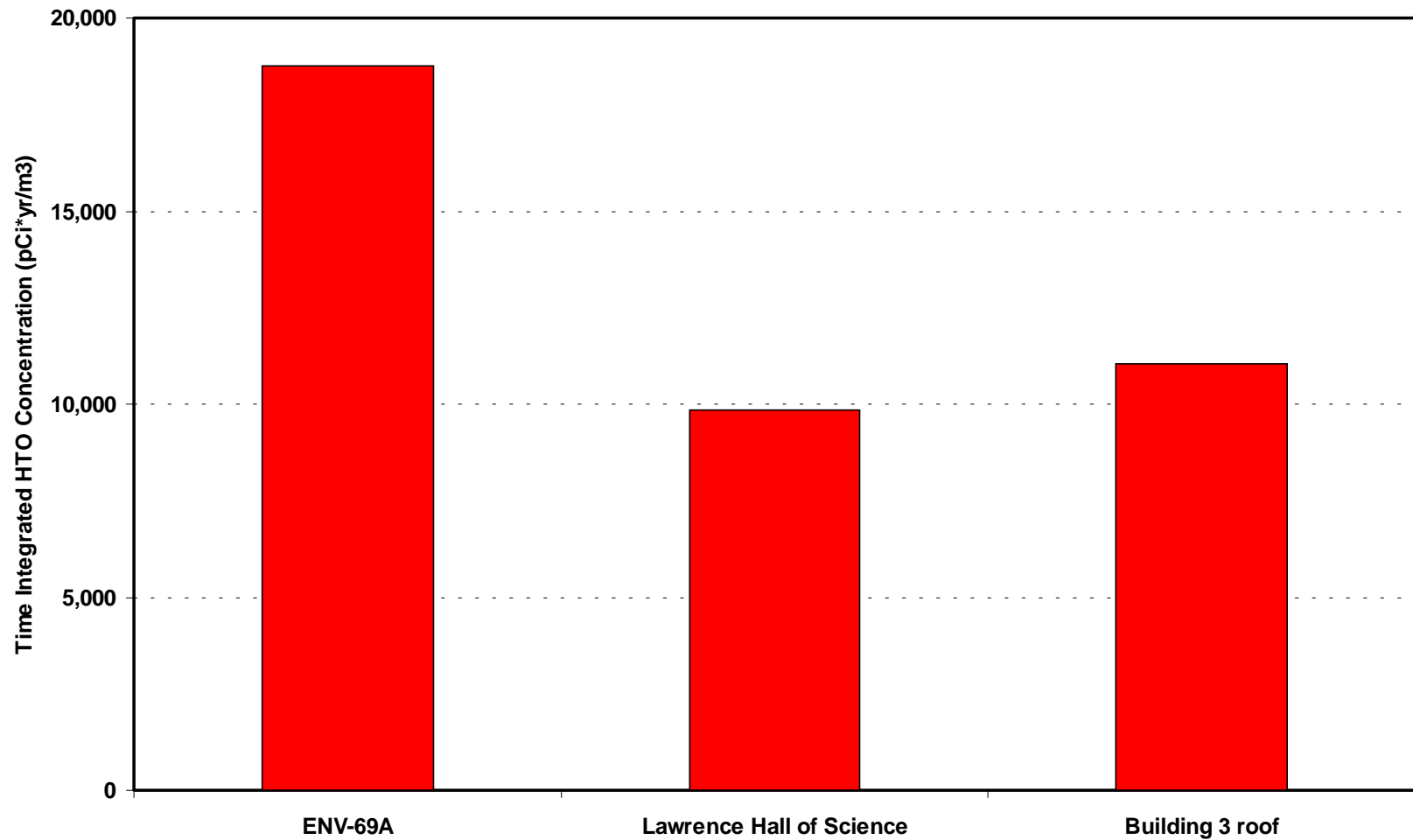
Expansion of ambient air monitoring to cover all 16 wind direction sectors (of 22.5° each) is recommended

The HASL-300 core method for soil sampling should be used; samples to be analyzed for additional depth increments.

The sampling of groundwater should be coordinated with the State of California Water Resources Board

Preliminary sampling efforts should be undertaken around Building 3 (Calvin).

Time integrated concentration of HTO in air (1972-1999)



B.2 Which other factors need to be addressed in EPA's evaluation of the Superfund status for the NTLF site?

Approach: Review whether NTLF operations will be typical during sampling period; review of non-radiological data (e.g. number of affected residents)

Findings to date:

The sampling report should include a section describing NTLF operations during sampling time when reporting the results.

EPA should provide information as to how the hazard ranking score would change if Lawrence Hall of Science would be regarded as a school, accounting for student population.

C.1 Which exposures to neutron and gamma radiation resulted from LBNL operations?

Approach: Review of historical data on neutron and gamma exposures

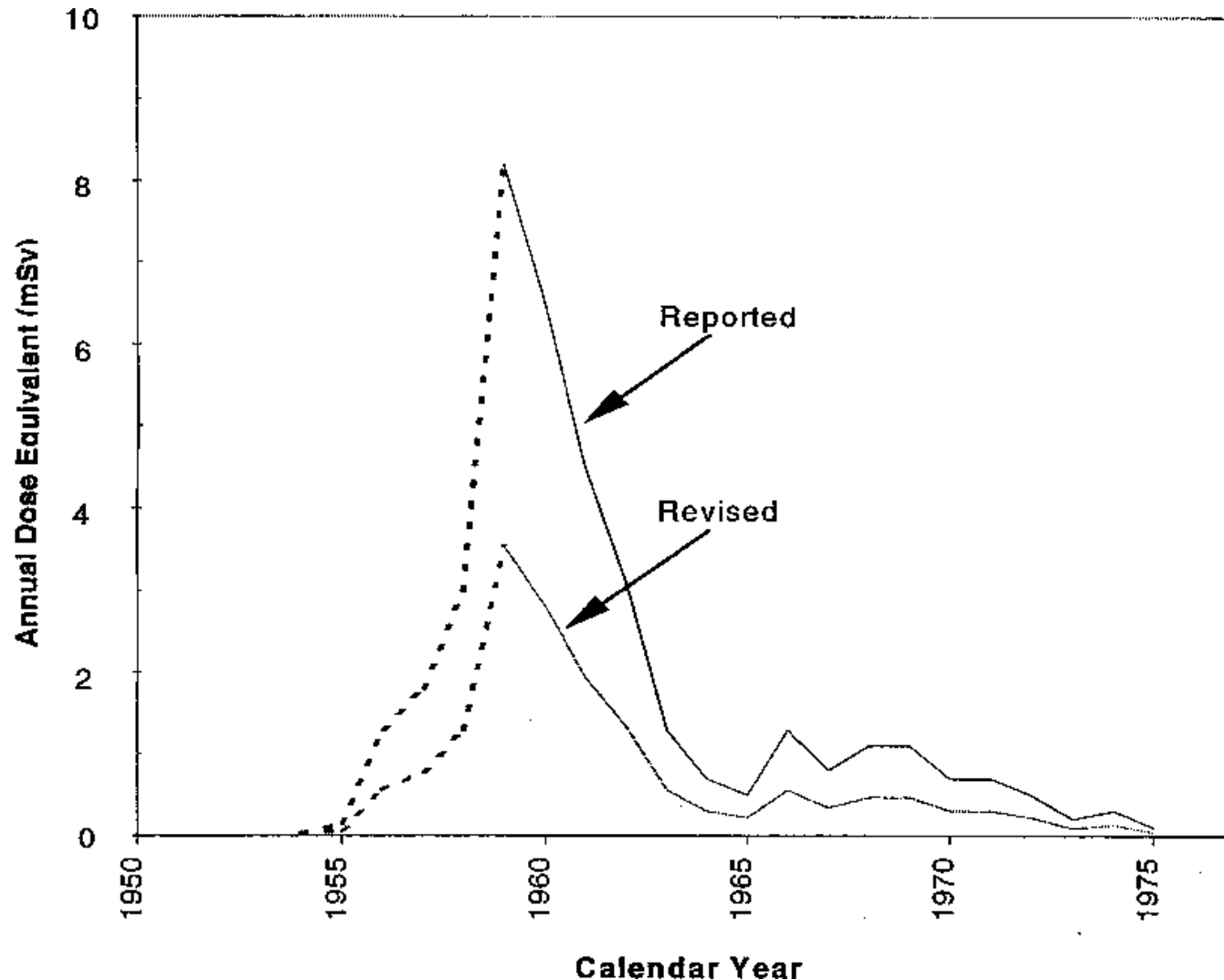
Findings to date:

Neutron and gamma doses at various locations at the LBNL site boundary were substantially larger than today. Peak exposures may have exceeded the then-prevailing limit of 500 mrem/yr using the historical conversion factors.

Using current conversion factors for neutron doses, cumulative doses at the Olympus Gate station were in the order of a few rem.

Reconstruction of doses to nearby residents is recommended, taking uncertainties and contribution all sources and pathways into account. Similar efforts were conducted at other DOE sites.

Comparison of reported dose equivalents for 1959-1975 with revised dose equivalents (Thomas et al., 2000)



C.2 Which exposures resulted from past releases of tritium?

Approach: Review of historical data on tritium emission and environmental concentrations

Findings:

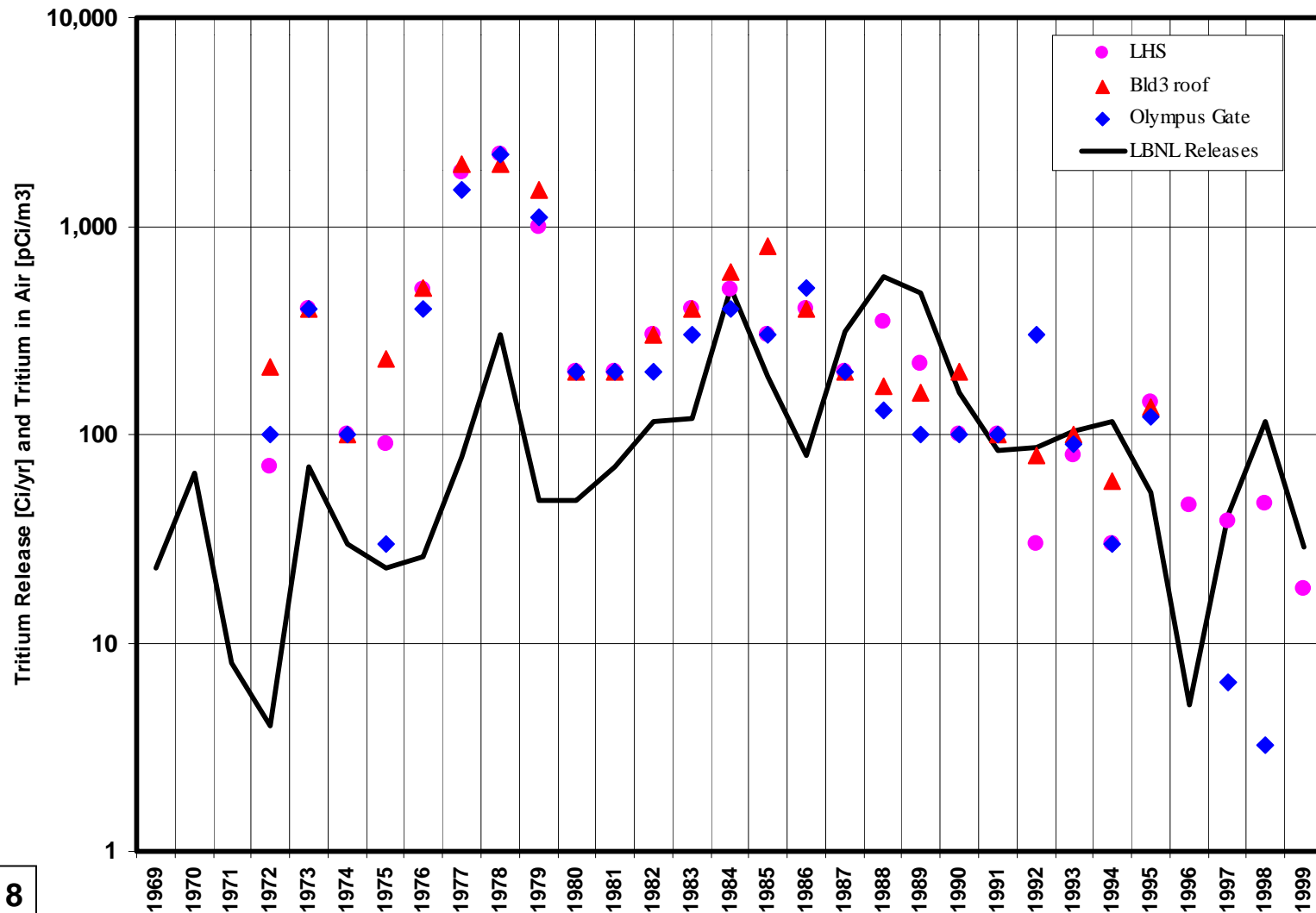
At face value, concentrations do not appear to have exceeded then-prevailing limits.

Concentrations in ambient air do not correlate with reported releases.

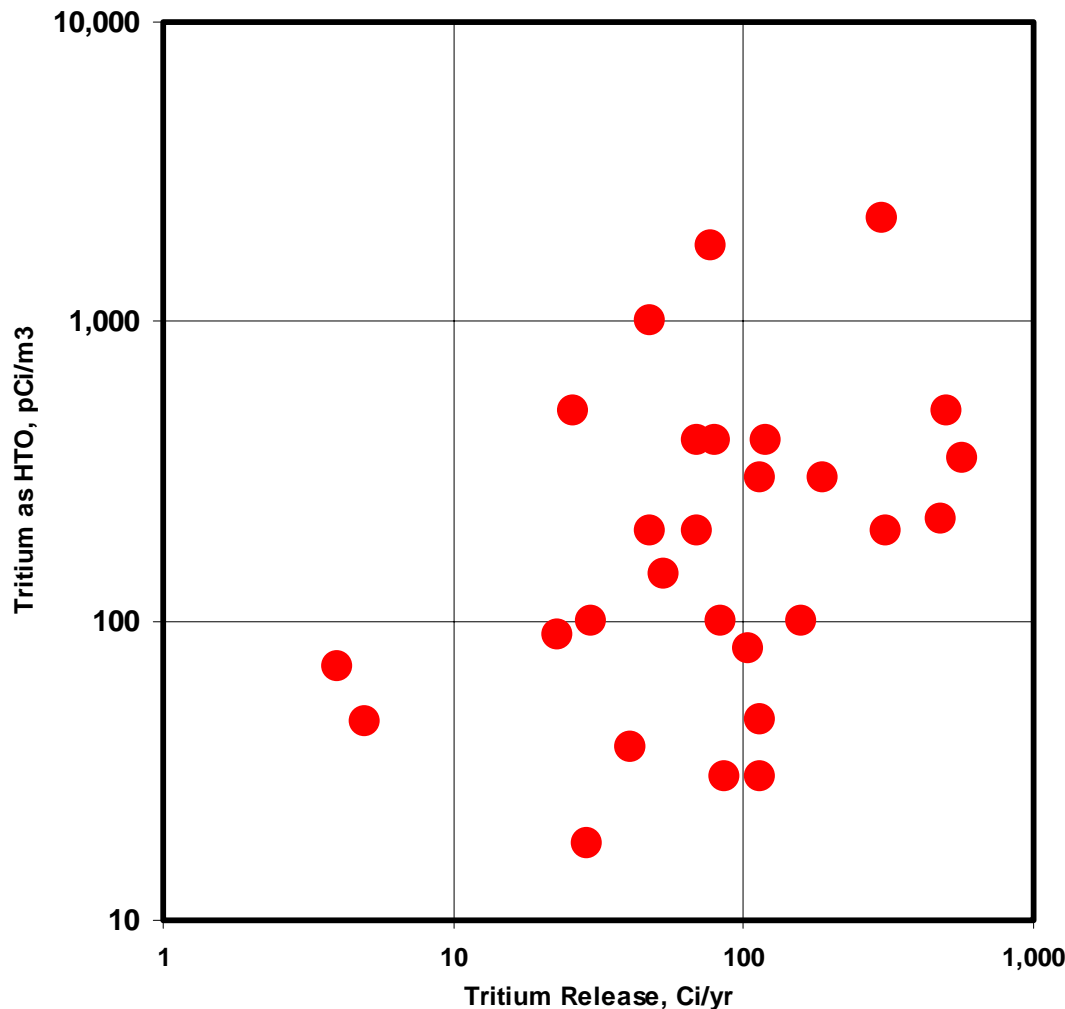
However, the accuracy of the data and the should be evaluated in light of the fact that pre-1995 measurements are considered unreliable.

Historical data regarding conditions around Building 3 on UC campus should be analyzed.

Reported tritium releases from LBNL and concentrations of HTO in air at environmental monitoring stations



Annual tritium releases from LBNL, 1972 to 1999 and annual concentrations of HTO in Air at Lawrence Hall of Science (LHS)



Concluding remarks

- The reported results were preliminary in nature, findings are subject to revision.
- Comments received will be incorporated into the draft final report to the City of Berkeley.
- The absence of proof is not the proof of absence.
- Quotation of two sentences does not tell the full story.
- I prefer to use the limited resources in this project to review and discuss the technical merits of the issues at hand with all parties involved.